Space Weather Forecast

Issued on Sunday, 14 May 2023 at 01:11 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

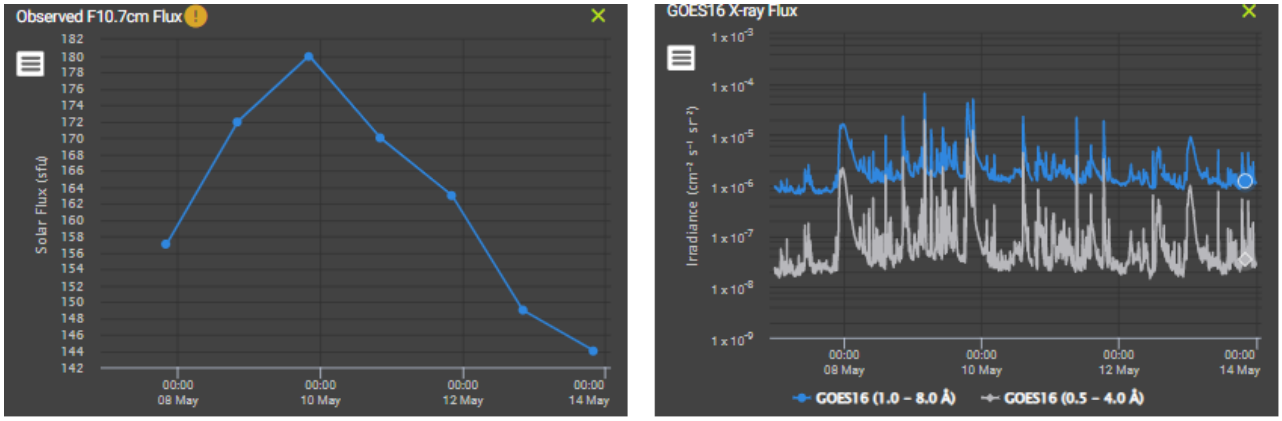
---

Space Weather Forecast Headline: Slight chance of Minor Geomagnetic Storm G1, fading before midweek UTC. Chance of R1/R2 radio blackouts, decreasing slightly into new week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the last 24 hours, with X-ray activity confined to occasional Common-class flares. These peaked with a long-duration event at 13/0044UTC, originating from a complex sunspot on the northwestern solar horizon. This event produced a mainly westward-heading Coronal Mass Ejection (CME), which was analysed as a deterministic miss, but with a small minority of MOSWOC Enlil model members having a slight glance possible straddling the UTC days of 15 into 16 May.

Figure 1: Left: radio wavelength flux as measured by Penticton observatory – this is a proxy for sunspot numbers and can be seen to be in decline after a midweek peak. Right: X-ray activity as recorded by a near-Earth satellite can be seen to be becoming less marked into the current UTC weekend.



A satellite data outage covered almost the entire period from 13/0130UTC, rendering sunspot analysis more difficult, and as a result observed sunspot trends are necessarily very general for the period. There are up to six regions visible in available imagery, with the most complex group in the northwest presumed to remain in place on the very edge of the Sun's facing side by inference from continuing Common-class X-ray activity.

No new major CMEs were observed in the period. At 13/2100UTC, a 'disappearing filament' was observed in ground-based near-infrared imagery from the northeast of the Sun. Any Earth-directed component is unlikely from this location, but with the caveat that confirming analysis has yet to be conducted. A similar such event was then seen from the southeast on the same imagery at 14/2300UTC, with analysis also yet to be conducted. The only other CME visible on imagery a

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

narrow feature that appears far-sided to no effect at Earth.

Solar Wind / Geomagnetic Activity: The solar wind was mainly suggestive of the last vestiges of the 09 May CME and then a nominal slow regime, however an unexpected solar wind magnetic field enhancement occurred later in the UTC day, perhaps introducing a minor fast wind regime after 14/2130UTC, although this is not yet conclusive. As part of this, the magnetic field associated with the solar wind changed from a very smooth and lowly level trend to linearly approach a slightly elevated peak at 20UTC, before returning to previous levels. The north-south component was consistently co-aligned with Earth's field (to limit geomagnetic effects at that time), with the notable exception of the UTC evening, which saw a sharp descent and stronger anti-alignment before recovering. The solar wind speed throughout this process remained unmoved from its descent through slightly elevated levels, while the number of particles in the solar wind was mostly within its typical background range, but peaking with the magnetic field enhancement in the early evening.

The net result of the above solar wind measures was nevertheless mostly quiet, but with a provisional peak below Minor Geomagnetic Storm G1 in the strongest anti-aligned period in the 18-21UTC interval.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity carries a chance of returning to Moderate, with this risk greatest over the current UTC weekend while the most complex spot group remains on the western solar horizon, else tentatively falling a little into the new working week, with no major returning regions expected.

Solar Wind / Geomagnetic Activity: The preferred forecast is for quiet conditions through this four-day period.

There are complicating factors: firstly in the form of up to three CMEs, namely the 11 May southwest Moderate class flare CME; the 12/0500UTC southwest 'filament' CME; and the 13/0045UTC western solar horizon CMEs that all have some form of glance in a minority of MOSWOC Enlil ensemble members on 14 through 16 May, however misses are all considered more likely - to no effect.

In addition to the above, there is a tenuous 'coronal hole' fast wind suggested in the MOSWOC Enlil model, although this is again not the preferred forecast. Should this occur it appears to be at least 24 hours away from upstream satellite evidence, and should not cause significant activity.

Energetic Particles / Solar Radiation: There is a daily slight chance of S1, decreasing slightly into the new working week as the main sunspot responsible for this risk crosses the best-connecting (should the spot flare appropriately) western solar horizon and rotates away.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	10	10	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	40	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	15	15	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.